TCT-616

Relationship Between Angiographic Dynamic and Densitometric Assessment of Myocardial Reperfusion and Survival in Patients with Acute Myocardial Infarction Treated with Primary Percutaneous Coronary Intervention: The HORIZONS-AMI Trial

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Background: Although primary percutaneous coronary intervention (PCI) restores brisk epicardial flow in ~90% of patients with ST-segment elevation myocardial infarction (STEMI), normal tissue myocardial perfusion (TMP) is less commonly achieved. TMP has been shown to correlate with early clinical outcomes, but its impact on long-term mortality is not well defined. Furthermore, the best methodology for determination of TMP has not been established.
Methods: We analyzed the outcomes of 3,267 patients in the HORIZONS-AMI study according to final TMP, assessed by angiographic dynamic (Dyn) and densitometric (Den) methods. Multivariable analysis was performed to identify the independent influence of TMP grade 2/3 (vs. grade 1/2) on survival.
Results: Dyn TMP 2/3 was achieved in 2,600 patients (79.6%) while Den TMP 2/3 was achieved in 2,483 (76.0%). Mortality was significantly lower in those with Dyn TMP 2/3 compared to TMP 0/1 at 30 days (1.1% vs. 6.9%, p<0.0001) and at 3 years (5.1% vs. 11.2%, p<0.0001). Similar results were obtained with Den TMP. Dyn TMP 2/3 was an independent predictor of mortality at both time points (HR [95%CI] = 0.21 [0.12, 0.37], p<0.0001 and 0.53 [0.38, 0.73], p<0.0001 respectively, Fig.), as was Den TMP. Survival was comparable in patients with TMP 2 and TMP 3.
Conclusion: Angiographic TMP can be assessed reliably using either Dyn or Den methods, and is a powerful, independent predictor of early and late mortality after primary PCI in STEMI. These data suggest TMP rates may be considered as a quality metric for assessing individual or hospital primary PCI outcomes.

TCT-617

Noninvasive Assessment of In-Stent Restenosis by High Definition Computed Tomography Coronary Angiography with New Gemstone Detector

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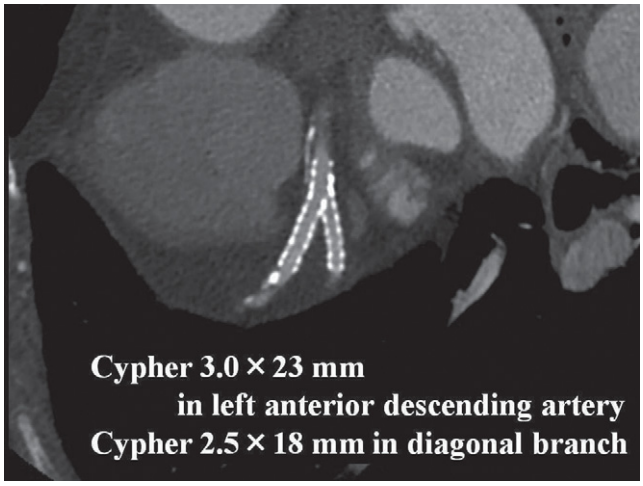
Background: Noninvasive assessment of in-stent restenosis (ISR) by computed tomography coronary angiography has been challenging. Recently high definition computed tomography (HDCT) coronary angiography with new gemstone detector has been developed, which has high spatial resolution, so it may lead to significant improvement of accuracy to diagnose ISR. The purpose of this study is to assess ISR using HDCT coronary angiography.
Methods: We enrolled consecutive 160 patients with previous coronary stent implantation who were received HDCT coronary angiography for clinical indications. HDCT coronary angiography studies were performed using a HDCT (GE Discovery CT750 HD). Image quality for the evaluation of ISR was assessed using 5-point grading scale: IQ score (1=excellent, 5=non-assessable). Significant ISR was defined as >50% luminal narrowing in the stent lumen or the presence of significant stent edge stenosis.
Results: 313 stents (average diameter 3.0±0.5mm) were evaluated. Image quality was good on average (IQ score 2.4±1.0). A total of 39 stents (12%) were of nondiagnostic image quality (IQ score 4 or 5) (feasibility 88%). In 109 stents compared with ICA, sensitivity, specificity, positive predictive value, and negative predictive value were 100%, 99%, 95%, 100%, respectively, when excluding unassessable stents. There was 104 stents, including 87 silorimus-eluting stents, with diameters of <2.5mm, and 75% was assessable (IQ score 2.8±1.1).



Conclusion: HDCT coronary angiography with new gemstone detector allows accurate noninvasive assessment of significant ISR. Noninvasive assessment of ISR using HDCT could be attractive and feasible alternative.

TCT-618

Quantitative Monitoring of Atherosclerotic Plaque Development and Characterization by Flat-Panel Computed Tomography

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Background: Background: Flat-panel computed tomography (FpCT) provides better spatial resolution than 64-channel CT and better assesses atherosclerotic plaque components in vivo in animal aortas similar in size to human coronary arteries. We assessed the usefulness of FpCT in longitudinal studies of plaque development.
Methods: We used a prototype FpCT scanner with a dual-panel rotating gantry and a commercial Performix CT x-ray source. Lesions in 184 aortic histology sections from 6 WHHL rabbits were quantitatively compared with 64-CT (image thickness, 0.625 mm) and FpCT (image thickness, 0.150 mm) images. In the current, long-term phase of the study, 30 NZW hyperlipidemic rabbits receive a high-fat diet (0.5% cholesterol). Lesions are monitored and correlated through monthly serial scanning sessions over 6 months. Images are collected 30 seconds after Visipaque injection (560 mgI/kg; through an ear vein) by using 500 views per rotation. Lesions are quantitatively monitored, and each plaque component is compared.
Results: Although FpCT was more sensitive in detecting eccentric lesions (42% vs 0%; P=0.000), the area under the curve (AUC) for FpCT (0.6) did not significantly differ from that for 64-CT (0.45; P=NS). In detecting plaques with ≤10% lipid (low-attenuation foci), FpCT was more sensitive than 64-CT (24% vs 0.7%; P<0.00) and had a greater AUC (0.6 vs 0.5; P<0.006). Additionally, FpCT was more sensitive (65% vs 0%; P<0.00) in detecting plaques with ≤5% calcium (high-attenuation foci) but not in detecting branch points. Both FpCT and histology could detect low-attenuation foci as small as 0.3 mm in diameter, whereas 64-CT could detect only low-attenuation foci ≥1.5 mm in diameter.
Conclusion: FpCT seems to have more potential in quantitative screening for low-risk small atherosclerotic lesions, whereas 64-CT is limited to imaging established, well-characterized lesions, particularly when measuring the vascular wall thickness in a rabbit model of atherosclerosis. FpCT seems to have potential for quantitatively monitoring the evolution of calcific and lipid components of plaque

TCT-619

Direct Mapping and Digital Reconstructions Of the Human Cardiac Venous Anatomy

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Background: It is important to identify and understand variations in the anatomy of the human cardiac venous system in order to best develop and then use minimally invasive cardiac devices. Hence, anatomical mapping of the cardiac venous system of a large sampling of human heart specimens, with and without disease, will be a beneficial aid for cardiac device designers.
Methods: We utilized fluoroscopy, a Microscribe 3Dx Digitizer (Ghost 3D, Castro Valley CA) and Imageware Software (Siemens, Plano TX) to obtain maps of the cardiac veins and to create 3D models. To date, we have created models for and taken anatomical measurements for 18 perfusion fixed human hearts.
Results: We have created a unique anatomical database for the major cardiac veins that include vessel diameters, arc lengths, tortuousities, and branching angles from the

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coronary sinus. Table 1 summarizes the mean anatomical measurements achieved from the major veins of 18 human hearts. The veins are labeled as follows: Posterior Interventricular Vein (PIV), Posterior Vein (PV), Postero-Lateral Vein (PLV), Lateral Vein (LV), Antero-Lateral Vein (ALV), and Anterior Interventricular Vein (AIV). Standard deviation, maximum, and minimum parameters were also taken.

Table 1: Mean anatomical parameters for 18 human cardiac venous systems

Vein	PIV	PV	PLV	LV	ALV	AIV
Number of Veins	18	11	8	12	7	15
Arc Length (mm)	115	86	65	78	48	113
Tortuousity	1.2	1.0	1.1	1.2	1.1	1.3
Branching Angle (°)	125	115	102	117	122	120
% Diameter < 1.0 mm	1.0	2.8	5.7	2.7	11.7	1.5
% Diameter < 1.5 mm	2.3	6.5	10.2	12.6	16.4	7.1
% Diameter < 2.0 mm	6.2	9.0	12.7	26.8	31.3	10.3

Conclusion: This novel database of cardiac venous anatomical parameters will allow one to better visualize and understand the degree of anatomical variability that exists between human hearts. We will continue to build this data set, which should be of great value for both device designers and those clinically implanting cardiac devices.

Intravascular Imaging: IVUS, OCT, Spectroscopy, and Other

(Abstract nos 621 - 691)

TCT-621

Long-term (5 years) Serial in vivo Evaluation of Chronic Stent Recoil after Drug-Elutig Stent Implantation: Does it exits?

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Background: Radial expansion and scaffold properties of stainless steel stents improved acute and mid-term outcomes of coronary angioplasty. However, late stent recoil has been proposed as one of the possible mechanisms of in-stent restenosis. We sought to investigate the temporal course of stent expansion using serial intravascular ultrasound (IVUS) after stainless steel drug-eluting stent (DES) implantation.
Methods: Twenty-two patients with single de novo coronary lesions were treated with DES with stainless steel platform (10 Cypher and 12 Biomatrix) and underwent intravascular ultrasound at post-procedure, 9-month and 5 years after implantation. We only included patients with at least three serial IVUS acquisitions (post procedure, mid and very long-term). The primary endpoint was the comparison of stent volume and stent volume index between index procedure, mid and very long-term follow-up.
Results: The mean age was 59 years, with 28% of diabetes mellitus. Stable coronary syndrome was the initial clinical indication for the majority of the cases (88%). Stent volume and stent volume index (SVI) were not significantly different between post-procedure and very-long term follow-up (stent volume 140.6 ± 39.1 mm3 vs. 139.9 ± 32.7 mm3, p=0.88 and SVI 7.7 ± 1.5 mm3/mm vs. 7.8 ± 1.6 mm3/mm, p=0.77). Vessel volume index also did not significantly changed between post-procedure and long-term follow-up (16.4 ± 4.7 mm3/mm vs. 15.1 ± 3.6 mm3/mm, p=0.28) with a low 5-year neointinal hyperplasia percent volume of obstruction (4.8%). Regarding incomplete stent apposition (ISA), 2 cases were observed at the index procedure and persisted until the last evaluation. There were no cases of acquired ISA.
Conclusion: The present serial IVUS assessment represents the longest serial evaluation of late stent expansion. There was no evidence of in vivo chronic stent recoil after stainless steel drug-eluting stent implantation.

TCT-622

The Clinical Impact of Intravascular Ultrasound in Patients Undergoing Implantation of Drug-eluting Stents in the Left Main

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Background: The clinical utility of intravascular ultrasound during left main stenting with drug-eluting stents (DES) has not been well understood. We sought to determine if the use of intravascular ultrasound during left main stenting with DES in high risk patients yields future clinical benefit in terms of survival, and reduction in recurrent myocardial infarction (MI) and revascularization.
Methods: Medical records of 624 patients who underwent left main coronary stenting between August 1990 and November 2010 at Mayo Clinic were reviewed. 329 patients who had implantation of bare metal stents were excluded. 111 patients who had intravascular ultrasound performed during DES stenting of the left main were compared with 184 patients with conventional angiography and stenting. Of the 295 patients with implantation of DES into the left main, 100 had unprotected left main disease. Information was collected on patient characteristics, comorbidities, presentation, ejection fraction, recurrent MI, target lesion and target vessel revascularization and mortality. The primary end point was mortality. Secondary end points were revascularization and MI.
Results: The two groups were well matched for clinical and angiographic characteristics. Patients undergoing IVUS during DES implantation were less likely to have had coronary artery bypass surgery, underwent more direct stenting, post-dilatation, and had shorter stent length. At three years, there was no difference in survival between the IVUS and NO IVUS group (15.8 vs.13.3%, p=0.833). There was no difference in revascularization (17.7 vs. 20.6%, p=0.994) between the groups. There was a trend towards increased MI in the IVUS compared to the NO IVUS group although not statistically significant (11.5% vs 5.3%, p=0.073). Among the 100 patients with unprotect left main and DES stenting; there were no difference in mortality, revascularization and MI between the groups.
Conclusion: Utilization of intravascular ultrasound during implantation of DES into the left main might not improve long-term mortality or reduce recurrent MI and revascularization.

TCT-623

Intravascular Ultrasound and Optical Coherence Tomography Comparison of the Self-expanding Sideguard Stent in the Sidebranch Versus a Balloon-Expandable Drug-Eluting Stent in the Main Vessel: Follow-up Results of Bifurcation Lesions Treated with this Novel Approach

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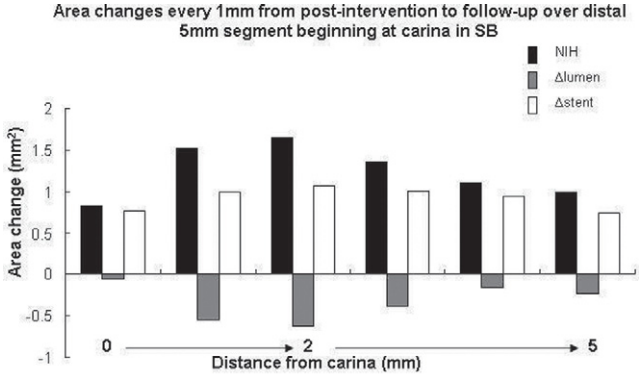
Background: The Cappella Sideguard sidebranch (SB) stent is a self-expanding, thin-strut, nitinol device with anatomic flaring at the SB ostium.
Methods: We performed intravascular ultrasound (IVUS) post-intervention and IVUS (n=28) and OCT (n=12) at follow-up and compared serial changes between the Cappella Sideguard stent in the SB and a balloon-expandable drug-eluting stent (DES) in the corresponding main vessel (MV).
Results: 1. Cappella Sideguard stent carinal area increased from 3.9±1.3mm2 post-intervention to 4.6±1.3mm2 at follow-up (p<0.001) that led no change in lumen area (3.9±1.3 to 3.8±1.2mm2, p=0.7) despite a neointimal hyperplasia (NIH) area of 0.8±0.8mm2. 2. Compared to the MV, in the SB there was a larger NIH volume and a significant increase in stent (4.9±3.6 vs 0.3±3.0mm3, p<0.001) and vessel volumes, with no difference in Δlumen volume. 3. NIH peaked 1-2mm distal to the carina (Figure). 4. Using OCTNIH thickness at the SB side of the bifurcation was greater than at the MV side, the percentage of uncovered struts was less (2.9% at SB vs 12.7% at MV, p<0.001), and 61% of floating stent struts at the carina were covered by smooth tissue.



Repeated ANOVA analysis: p=0.044 for NIH; p=0.19 for Δlumen; p=0.19 for Δstent; n=23

Conclusion: The self-expanding Cappella Sideguard stent maintains an adequate lumen, especially at the SB carina at follow-up, with NIH accumulation mainly 1~2mm distal to the carina that correlates to the increase in stent dimensions.

TCT-624

Comparison by Optical Frequency-Domain Imaging of Paclitaxel-Eluting Stents and Everolimus-Eluting Stents Implanted in One Coronary Artery in One Procedure. A 12 Months Follow Up Evaluation

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Background: Optical frequency-domain imaging (OFDI) allows a detailed assessment of intimal coverage and strut apposition which are factors well known associated with late thrombosis. This study seeks to asses and compare long term intimal coverage and stent apposition with paclitaxel-eluting stents (PES) Taxus Liberte TM and everolimus-eluting stents (EES) Xience Prime TM.
Methods: We have applied a particular clinical model, that of a same patient with two